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CASE REPORT

Capsular Contraction with S-Shaped Deformity of Nonlength-Expanding Inflatable Penile Prosthesis Cylinders: Management and Prevention Strategies

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ABSTRACT

Introduction. Capsular contraction (CC) occurring with inflatable penile prosthesis (IPP) reservoirs has been reported by urologists as a cause of autoinflation. The concept of CC occurring around IPP cylinders has not been studied.
Aims. Herein we report a case of CC occurring with nonlength-expanding IPP cylinders, resulting in an S-shaped deformity.
Main Outcome Measures. We sought to report a novel cause of S-shaped deformity in patients after IPP surgery.
Methods. We reviewed a recent clinical case and conducted a literature review on capsular scar formation in prosthetic surgery. We also conducted a literature review of the inflammatory cascade related with prosthetic surgery.
Results. Capsular contracture of nonlength-expanding cylinders resulting in S-shaped deformity has not been previously reported. The role of certain inflammatory markers seems to play a common role of capsular contracture in the penis and other prosthetic implantation sites.
Conclusions. Capsular contractures around the cylinders of an IPP can cause deformity, even in patients who have appropriately sized, nonlength-expanding cylinders. A better understanding is needed regarding the mechanical properties of the tunica albuginea and the inflammatory cascade associated with penile implant surgery. This case represents an argument for early and aggressive postoperative inflation of the IPP. Future studies should evaluate the role of inflammation modulators as adjuvant therapy after IPP surgery. **Karpman E and Henry G. Capsular contraction with S-shaped deformity of nonlength-expanding inflatable penile prosthesis cylinders: Management and prevention strategies. Sex Med 2013;1:95–98.**

Key Words. Penile Prosthesis; S-Shaped Deformity; Capsular Contraction; Erectile Dysfunction; Penis; Surgery

Introduction

The concept of capsular contraction (CC) for prosthetic devices is well known and documented in the medical literature. CC results from a fibrous capsule developing around an implant placed in the human body, with resultant disuse contractures preventing proper function of the implant. Plastic surgeons have reported CC with breast implants, resulting in deformity of the implants and an unnatural appearance. The CC occurring with inflatable penile prosthesis (IPP) reservoirs has been reported by urologists as a cause of autoinflation of the IPP [1,2]. This phenomenon of CC is the reason plastic surgeons recommend breast massage shortly after implantation.

The concept of CC surrounding IPP cylinders is less understood, with a paucity of medical literature to support its existence. However, one of the most common complaints of patients after IPP

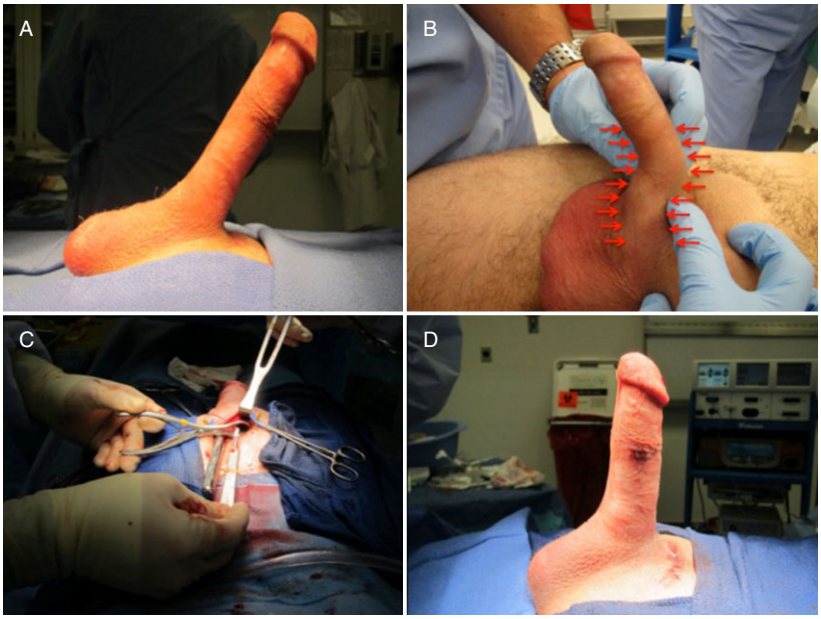

Figure 1 (A) Immediate postoperative photo at initial implantation. (B) Appearance of penis fully inflated with S-shaped deformity (red arrows) 3 months postoperative. (C) Incisions of fibrous capsule using nasal speculum and scalpel. (D) Results after cylinder downsizing and incision of capsular contractures.

surgery is decreased penile length [3,4]. Such decreases have been attributed to undersizing of the implant cylinders and unrealistic patient expectations, but an alternative theory could also implicate CC as partially responsible for this outcome. S-shaped deformities had been reported with an older version of the Ultrex (American Medical Systems [AMS], Minneapolis, MN, USA) implant, which had "unlimited" length expansion [5,6]. Because of these findings, newer versions of the Ultrex/LGX are limited to a 25% increase. To our knowledge, this is the first reported case of CC with nonlength-expanding IPP cylinders, resulting in an S-shaped deformity. The patient was managed with revision surgery and early cylinder cycling: cylinder downsizing resulted in loss of 2 cm of erect penile length. Patient management and prevention strategies are discussed.

Case Report

A 52-year-old male had an uncomplicated IPP procedure performed for vasculogenic impotence refractory to medical therapy. He had no medical history of keloids or other scarring problems. The procedure was performed through an infrapubic approach. An AMS 700 series CX prosthesis (21 cm with 3 cm rear tip extenders) was placed, for an intracorporal measurement of 24 cm. The patient's preoperative stretched penile length was 16 cm, which was similar to his penile length with the IPP fully inflated immediately after surgery. Photos in the immediate postoperative period demonstrated an excellent result (Figure 1A). The patient provided written informed consent to have his results published; all appropriate ethical guidelines were followed.

The patient was evaluated by the surgeon at 1 and 3 weeks after surgery per routine postoperative protocol and was found to be healing appropriately. The patient was instructed to start inflating his IPP 1 week after surgery and was given clearance to resume full sexual activity at 3 weeks, once he had demonstrated understanding of how to use the device, and all visible healing was completed. At 3 weeks after surgery, the patient had an excellent cosmetic and functional result similar to the immediate postoperative results. He was given instructions to maximally inflate his IPP daily for 15 minutes for 3 months until his next follow-up appointment, regardless of sexual intercourse frequency.

The patient suffered an unrelated dominant hand injury shortly after completing his 3-week follow-up visit and was unable to follow the postoperative instructions to maximally inflate his IPP daily. He reported inflating his implant only once every 1 or 2 weeks. He did not notify his surgeon of the injury until his 3-month postoperative visit. When the patient returned to the clinic after 3 months as scheduled, he complained of new onset curvature and difficulty fully inflating his prosthesis. There were no complaints of fever, chills, or pain. Physical examination demonstrated an obvious S-shaped deformity of the left cylinder and buckling of the right cylinder, without evi-

dence of erythema, induration, fluctuance, or erosion (Figure 1B). No further imaging was obtained. The problem was discussed, and the patient decided to proceed with revision surgery.

The patient underwent exploratory penile surgery through his previous infrapubic incision. The previous corporotomy was opened, and the AMS CX cylinders were removed. Prior to antibiotic irrigation, aerobic and anaerobic culture swabs were taken from each corpus and were found to be negative for bacterial growth. The corpora were irrigated with copious amounts of antibiotic solution prior to re-measuring the intracorporal length with a Furlow instrument (American Medical Systems, Minnetonka, MN, USA). Both corpora measured 22 cm—2 cm less than measured at initial surgery. Using a #15 scalpel, intracorporal incisions were made on the lateral and ventral sides of the capsules to release the contractures and to prevent kinking of the cylinders (Figure 1C). After the old cylinders were removed, the blade was slid inside the capsule, inside the old cylinder space, and the walls of the capsule were incised. We replaced the previous AMS CX cylinders with new AMS CX cylinders and a 1-cm rear tip extender. Inflation of the implant confirmed correction of the S-shaped deformity with shortening of the penile length (Figure 1D).

The surgery was performed as an outpatient procedure. The implant was left fully inflated for 1 week, at which time the patient was instructed to start a maximum inflation protocol. The implant was to be inflated to maximum pressure and left inflated for at least 15 minutes, twice daily for 3 months. The patient was seen at 3 months after his revision surgery and had complete correction of his S-shaped deformity with results similar to his postoperative result. His penile length at maximal inflation was 14 cm.

Discussion

This is the first case report, to our knowledge, of an S-shaped deformity in a *nonlength-expanding* penile implant due to CC around the implant cylinders. It has been reported that these cylinders expanded beyond the elastic limits of the tunica albuginea, causing buckling. It is unlikely these deformities are present at the time of surgery, or the surgeon would make immediate adjustments. Oversizing implants or length-expanding implants may not be the only cause of such a deformity. Our proposed explanation is that a fibrous capsule forms around the cylinders weeks after surgery is thick and noncompliant, contracts like most scar tissue, and causes the cylinders to buckle or form an S-shaped deformity when inflated. Our patient's evolution of an S-shaped deformity more than 3 weeks after surgery supports this explanation, as do immediate postoperative photos and penile length measurements confirming appropriate sizing of the implant.

Dense fibrous capsules, known to form around all artificial devices placed in the body, are essentially scar capsules [7]. In the urologic literature, the pathophysiology of CC has only been presented in occurrence around the reservoir of an IPP [1,2]. In contrast, CC after breast implant surgery has been studied more extensively [7] and found to involve an inflammatory cascade mediated by transforming growth factor (TGF)-B1 and TGF-B2 [8]. Of note, Peyronie's disease, which is a scar reaction to trauma in susceptible men, causing shortening and disfigurement of the penis, has also been shown to result from an inflammatory cascade mediated by TGF-B1; in fact, experimental models of Peyronie's disease are simulated with injection of TGF-B1 directly into the tunica albuginea [9]. Perhaps CC and Peyronie's disease should be considered to exist within the spectrum of the same disease process, mediated by the same inflammatory messengers and resulting in various degrees of deformity in the affected tissue.

Prevention of CC after silicone breast implantation has been evaluated from a biochemical and clinical standpoint. Capsular contracture has been reported to result from activation of the immune system by silicone particles on the surface of implants. Leukotrienes such as TGF-B have been implicated in the biochemical cascade of CC formation [7]. Reports on use of anti-leukotrienes, such as zafirlukast (20 mg twice daily), and angiotensin-converting enzyme inhibitors, such as enalapril, have been reported with variable success in preventing CC with breast implants. Similarly, the urologic literature has shown variable success rates using pentoxyfilline, an inhibitor of TGF-B1, in the management of Peyronie's disease [9].

Our case represents an argument for early and aggressive inflation of the IPP postoperatively; perhaps in the future, after more research evidence is accumulated, adjuvant medications to prevent TGF-B1-mediated CC could be used in the early postoperative period. For now, a growing trend in IPP surgery is to implement a maximum inflation protocol in the early postoperative period to optimize penile length. There is discussion on increases in length after implantation of length-expanding

cylinders coupled with a maximum inflation protocol. The urologic literature has demonstrated that the tunica albuginea responds favorably to gradual mechanical forces applied to it in the form of vacuum erection and traction devices for preoperative penile stretching and for the treatment of Peyronie's disease. An appropriately sized IPP may have the same effect as a vacuum erection or traction device on the penis. After all, what is an IPP other than an internal penile stretching device? Moreover, the pressure generated by a hydraulic pump is much greater than a pneumatic suction.

More subtle cases of CC may result in penile shortening without obvious S-shaped deformity. Attempts at conservative management should be tried with aggressive inflation/cycling of the implant in the office or in the operating room under sedation. Milder cases of S-shaped deformity can resolve with repeated and aggressive patient cycling of the implant. However, more severe cases require surgical revision. Because we do not know for sure when the dense fibrous capsule around the cylinders becomes incapable of morphologic change from repeated inflation, we encourage all of our patients, especially those implanted with length-expanding cylinders, to start cycling their implants starting at 1 week after surgery and continue to do so daily for the first 3 months postoperatively. Wilson et al. reported that even in men with severely fibrotic corpora from previous implant removal, it is possible to change the morphology of the corpora with initial implantation of narrow cylinders and subsequent upgrading to normal girth cylinders after a period of time in addition to repeated inflation [10]. Unforeseen circumstances prevented our patient from adhering to our protocol.

The understanding of mediators involved in CC and wound healing begs additional questions: Can we improve the results of penile length and girth expansion in men implanted with length-expanding cylinders by using adjuvant TGF-B1 inhibitors postoperatively? Are inflammatory mediators such as TGF-B1 preventing our patients from reaching maximum potential after IPP surgery? This case has caused us to modify our postoperative protocol. In addition to instructing them to perform a maximum inflation protocol, all patients now are started on pentoxyfilline 400 mg three times daily for 3 months postoperatively.

Conclusion

Capsular contractures around the cylinders of an IPP can cause deformity, including buckling and S-shaped deformity, even in patients who have appropriately sized nonlength-expanding cylinders. Better understanding is needed regarding the mechanical properties of the tunica albuginea and the inflammatory cascade associated with penile implant surgery. Future studies should evaluate the role of inflammation modulators as adjuvant therapy after IPP surgery.

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